Application No.: 09/314,637
Art Unit: 2654

Attorney Docket No.: 113607

REMARKS

Reconsideration and allowance in view of the foregoing amendments and the following remarks are respectfully requested.

By this amendment, claims 14-16, 18-27 and 30-37 remain pending, claims 14-16, 18, 19, 21-27, 30, 32, 33 and 35-36 have been amended, claims 13, 17 and 29 have been newly canceled without prejudice or disclaimer, and claim 37 has been newly added.

Rejection of Claims 17-19, 21-27, 29-34 and 36

On page 2 of the Office Action, the Examiner rejected claims 17-19, 21-27, 29-34 and 36 under 35 U.S.C. 103(a) as allegedly being unpatentable over U.S. Patent No. 5,970,449 to Alleva et al. ("Alleva") in view of U.S. Patent No. 5,613,037 to Sukkar. Applicants canceled claims 17 and 29 without prejudice or disclaimer, thereby making the rejection to these claims moot. Applicants, therefore, respectfully request that the rejection of claims 17 and 29 be withdrawn. Applicants amended claim 21 to be in independent form to include the features of claim 17 and amended claim 33 to be in independent form to include the features of claim 29. Claims 18, 19 and 22-27 were amended to depend from claim 22 instead of canceled claim 17 and claims 30, 32, 35 and 36 were amended to depend from claim 33 instead of canceled claim 29. Applicants traverse the rejection with respect to claims 21, 27, 33, 34 and 36 and submit that the amendments obviate the rejection with respect to the remaining claims.

Amended independent claim 21 is directed to a method including, among other things, performing a speech recognition process on a received speech signal to produce speech recognition results, wherein the speech recognition process is based on a set of acoustical models that has been defined for a numeric language, and the numeric language includes a subset of a vocabulary, the subset of the vocabulary includes words that identify

digits in number strings and words that enable the interpretation and understanding of number strings, wherein the numeric language includes digits, natural numbers, alphabets, re-starts, and city/country name classes. On pages 5 of the Office Action, the Examiner admitted that Alleva does not disclose or suggest a numeric language that includes a restarts class. The Examiner alleged that Sukkar, at col. 5, lines 48-52, discloses or suggests this feature. Applicants respectfully disagree.

Sukkar, at col. 5, lines 44-52, discloses:

> Digit/Non-digit Classification Stage 310 comprises a classifier that is trained discriminatively to separate two classes. One class represents speech containing valid digits that are correctly recognized, while the other consists of two components: speech not containing a digit, and speech containing digits that are misrecognized by the HMM recognizer. Misrecognitions (i.e., substituting one digit for another) are included in the second class so that putative errors can also be rejected.

Thus, Sukkar discloses a classifier that separates Hidden Markov Model (HMM) recognizer output into two classes. One class is for speech that includes valid digits that are correctly recognized and a second class includes speech not including digits and speech including digits that are not correctly recognized by the HMM recognizer.

According to the Applicants' specification, at page 6, lines 8-9, "Restarts include the set of phrases that are indicative of false-starts, corrections and hesitation." Applicants submit that a class that includes digits that are not correctly recognized by a Hidden Markov Model (HMM) recognizer is in no way equivalent to a set of phrases that are indicative of false-starts, corrections and hesitation. Therefore, Sukkar does not disclose or suggest, either separately or in combination with Alleva, a numeric language that includes digits, natural numbers, alphabets, re-starts, and city/country name classes, as required by claim 21. Further, an inability of a HMM recognizer to properly recognize a digit in spoken input is a reflection of the accuracy and reliability of the HMM recognizer and is not a class of a numeric language. For at least these reasons, Applicants respectfully request that the rejection of claim 21 be withdrawn.

Claims 18-27 depend from claim 21 and are patentable over Alleva in view Sukkar for at least the reasons discussed with respect to claim 21.

Further, Applicants submit that claim 27 is also patentable over Alleva in view Sukkar for other reasons. For example, claim 21 recites generating a sequence of digits using the speech recognition results, wherein generating is based on a set of rules. Claim 27 depends from claim 21 and further recites that the set of rules includes a numeric phrases rule that realigns digits. In the Office Action of June 17, 2005, as well as the previous Office Action, the Examiner rejected claim 27 without any discussion of this feature. Applicants submit that Alleva and Sukkar fail to disclose or suggest, either separately or in combination, a set of rules that includes a numeric phrases rule that realigns digits, as required by claim 27.

Amended independent claim 33 is directed to a system that includes, among other things, a string validation processor that outputs validity information based on a comparison of a sequence of digits output by the numeric understanding processor with valid numbers in the validation database. On page 9 of the Office Action, the Examiner admitted that Alleva fails to disclose or suggest a string validation processor. The Examiner relied on Sukkar, at col. 7, lines 6-49, to disclose this feature. Applicants respectfully disagree.

Sukkar, at col. 7, lines 6-49, discloses:

> For each digit in the vocabulary set (1-9, "oh" and "zero"), the loss function is minimized with respect to a_i and a_{fi}, (or A_i), resulting in a separate a_i and a_{fi} set for each digit in the digit set. The minimization is carried through iteratively using the gradient descent method, as follows,
>
> $$(A_i)_{n+1} = (A_i)_n - \varepsilon \nabla (L_i(A_i))n,$$
>
> where $(A_i)_n$ is the GPD weight vector at the n^{th} training sample, $\nabla(L_i(A_i))_n$ is the gradient of the loss function with respect to A_i evaluated at the n^{th} training sample, and ε is the update step size.
>
> Given an unknown speech segment with a discrimination vector pair x_i and x_{fi}, the classification is performed by computing a confidence score, defined as

$$C_i = R(x_i, a_i) - R(x_{fi}, a_{fi}).$$

> The confidence scores for all the digits in the recognized string are then passed to the string verification stage 312 to make the string rejection decision.
>
> The whole candidate string is verified (312, FIG. 3) based on the individual candidate digit confidence scores. Although there are various ways to combine the confidence scores to make the rejection decision, a simple approach is used in the exemplary embodiment of this invention. Each confidence score is compared to a predefined individual threshold that is a function of the digit under test. Each individual threshold varies as a function of the difficulty of detecting a specific digit. If any of the digits in the string does not pass the comparison test, the whole string is rejected. In this way substitution errors of only a single digit in the string are likely to cause the string to be rejected, which is a desirable feature for many applications. Thus, this rejection method is successful in not only rejecting speech with no connected digits, but also in rejection putative errors that would have passed but for the rejection mechanism, and it does not require analysis of each possible combination of all digits. An alternate way of performing the string classification is that the confidence scores for all digits may be combined and compared to either a predefined threshold or a combination of selected thresholds

Thus, Sukkar discloses verifying each string based on a respective confidence score for each individual digit. Each confidence score is compared to a threshold. If any of the digits in a string fail to pass the comparison test, the whole string is rejected. Applicants submit that this is not equivalent to a string validation processor that outputs validity information based on a comparison of a sequence of digits output by the numeric understanding processor with valid numbers in the validation database, as required by claim 33. For at least this reason, Applicants respectfully request that the rejection of claim 33 be withdrawn.

Claims 30-32 and 34-36 depend from claim 33 and are patentable over Alleva in view of Sukkar for at least the reasons discussed with respect to claim 33. Therefore, Applicants respectfully request that the rejection of claims 30-32 and 34-36 be withdrawn.

Further Applicants submit that claim 36 is also patentable for other reasons. For example, claim 36 is similar to claim 21 and is patentable over Alleva in view of Sukkar for reasons similar to those provided with respect to claim 21.

Rejection of Claims 13-16, 20 and 35

On page 10 of the Office Action, the Examiner rejected claims 13-16, 20 and 35 under 35 U.S.C. 103(a) as allegedly being unpatentable over Alleva in view of Sukkar and further in view of U.S. Patent No. 5,937,384 to Huang et al. ("Huang"). Applicants canceled claim 13 without prejudice or disclaimer, thereby making the rejection of claim 13 moot. Applicants, therefore, respectfully request that the rejection of claim 13 be withdrawn. Applicants amended claim 14 to be in independent form to include the features of claim 13. Claims 15 and 16 were amended to depend from claim 14, instead of canceled claim 13. Claim 35 was amended to depend from claim 33, instead of canceled claim 29. Applicants traverse the rejection with respect to claim 14. Applicants submit that the amended claims obviate the rejection with respect to the remaining pending claims.

Amended independent claim 14 is directed to a speech recognition method including, among other things, defining a numeric language including a subset of a vocabulary, the subset of the vocabulary including words that identify digits in number strings and words that enable the interpretation and understanding of number strings, wherein the numeric language includes digits, natural numbers, alphabets, re-starts, and city/country name classes. Applicants submit that claim 14 is similar to claim 21 and is patentable over Alleva and Sukkar for at least the reasons discussed with respect to claim 21. Huang fails to satisfy the deficiencies of Alleva and Sukkar. Therefore, Applicants respectfully request that the rejection of claim 14 be withdrawn.

Claims 15 and 16 depend from claim 14 and are patentable over the cited art for at least the reasons discussed with respect to claim 14. Therefore, Applicants respectfully request that the rejection of claims 15 and 16 be withdrawn.

Claim 20 depends from claim 21, which is patentable over Alleva and Sukkar for the reasons discussed with respect to claim 21. Huang fails to satisfy the deficiencies of Alleva

and Sukkar. Therefore, Applicants respectfully request that the rejection of claim 20 be withdrawn.

Claim 35 depends from claim 33, which is patentable over Alleva and Sukkar for at least the reasons discussed with respect to claim 33. Huang fails to satisfy the deficiencies of Alleva and Sukkar. Therefore, Applicants respectfully request that the rejection of claim 35 be withdrawn.

New Claim 37

New claim 37 is directed to a system and claims features similar to those of claim 33. Applicants submit that new claim 37 is patentable at least for reasons similar to those discussed with respect to claim 33.

CONCLUSION

Having addressed all rejections, Applicants respectfully submit that the subject application is in condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,

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